SITE BUILT HOUSING WEATHERIZATION SPECIFICATIONS[i]
October 1, 2003
PART I--INSTALLATION PROVISIONS

Index to Sections

[i] These Site Built Housing Weatherization Specifications were prepared by Bonneville in Cooperation with Regional Utilities, State Energy Organizations, and Product Manufacturers. These specifications appear in three parts: Part I is the Installation Provisions; Part II is the Material Provisions; and Part III contains the appendices.

101.000 **INTRODUCTION**

.005 These specifications provide minimum requirements for weatherization in order to claim deemed savings credits under Bonneville Power Administration's Conservation and Renewable Resources Rate Discount Program.

.010 Utilities shall provide more descriptive Installer provisions to be used between the Utility and Installers.

.015 These specifications are based on the most recently published codes and regulations and are intended to meet or exceed applicable existing codes and regulations. Codes and regulations, however, are updated periodically and are also subject to change through the code processes at State and local jurisdictions. Therefore, the specifications, codes, and regulations shall apply as follows:

.1 Weatherization Measures shall be installed in accordance with these specifications, all applicable State and local codes and Federal regulations, and the most recent versions of the Uniform Codes and the National Electric Code;

.2 where State or local code and specification requirements are in conflict, the most stringent of the requirements shall apply. When State or local codes are less restrictive, Bonneville may approve their use in lieu of these specifications. Such approval must be requested in writing by the Utility and approved in writing by Bonneville prior to installation of the Measure; and

.3 in cases where a specific application is not addressed in the specification, codes, or regulations, the Utility shall determine the appropriate action consistent with the codes and these specifications. Utility decisions in these instances shall be thoroughly documented in the Residence file.

.020 The Utility reserves the right to add more restrictive requirements to the provisions contained in this specification and/or to require that additional provisions defined by the Utility be met under the Conservation and Renewable Resources Rate Discount Program.

101.030 **Definitions**

For purposes of this specification, the following definitions apply. All other applicable definitions can be found in the main body of this Agreement.

.1 Permanent Housing. A Building containing Residence(s) which is either constructed on a site or transported to a site and is permanently located on that site designed never to be moved. It is not a Mobile Home.

.2 Code. The most recent edition of the Uniform Codes written by the International Conference of Building Officials (ICBO) including the Uniform Building Code (UBC), the Uniform Mechanical Code (UMC), Uniform Plumbing Code (UPC), Uniform Fire Code (UFC), and other associated codes and the National Electric Code (NEC) written by the National Fire Protection Association (NFPA) and associated codes.

102.000 SPECIFICATIONS FOR DETERMINING ELIGIBLE MEASURES

.005 The Utility shall be responsible for determining weatherization Measures eligible to be installed in each Residence per this specification.

103.000 GENERAL REQUIREMENTS FOR UTILITIES

.005 All weatherization shall be completed in a manner that will provide a safe, permanent, effective, and Workmanlike installation.

.010 Materials, components or products installed under this Program shall meet the criteria defined in the Material Provisions, Part II of this Item.

.015 Materials damaged in shipment or in assembly shall not be used.

.020 Structural members and Building components shall be free of decay and structurally sound before the weatherization Measure is installed.

.025 The Utility shall verify that the Installer has separately identified any unusual (but necessary) costs that affect the price in providing a safe, permanent, effective, and Workmanlike weatherization installation.

103.030 The Utility shall verify that the Installer has indicated in writing to the Homeowner or Homeowner Designee the types of materials to be used, brand names, methods of installation, identification of special problems, and other information which would minimize misunderstandings.

.035 Weatherization materials, products and labor shall be warranted by the Installer against failure due to manufacturing and installation defects for a period of at least 2 years, from the installation date, except that sealed, insulated-glass units shall be warranted against failure of the seal for a minimum of 5 years. The Installer shall provide a written warranty, with the installation date, to the Homeowner or Homeowner Designee. Manufacturers' written warranties may be used by Installers to satisfy a part of this requirement where appropriate.

.040 It is the Installer's responsibility to check clearances and access in attics and crawl spaces prior to job commitment, and to make appropriate allowances for ducts, joists, or other installation obstructions.

.045 The Installer is responsible for determining that the ceiling, floor, or wall systems are structurally adequate to support the combined weight of all materials imposed on the ceiling, floor, or wall. The Installer shall be responsible for damage incurred during or as a result of the installation of any materials and associated work.

.050 Installers shall provide permits, materials and labor necessary to install weatherization Measures in the Residence.

104.000 **INSULATION**

.010 Insulation shall be installed in areas of the Residence envelope that separate Conditioned Space and unconditioned or outside spaces where none exists or where the R-value is less than that prescribed in this specification.

.020 The Utility shall maintain a copy of an Installer certificate containing the following information where loose fill insulation is installed in ceilings, walls, or floors:

.1 address of the Residence;
.2 date of Installation;
.3 name and Address of Installer;
.4 the estimated R-value of any existing insulation;
.5 the amount, R-value, depth and type (including product name) of insulation installed by the Installer;
.6 final R-value of insulation; and
.7 area of the space (in square feet) insulated.

.030 Exhaust fans that terminate in attics, crawl spaces, or other spaces, shall be extended through to the outside and sealed to prevent any exhaust air from entering back into the space.

104.100 **Health and Safety Requirements**

.105 All insulation materials installed under this specification shall meet all applicable material requirements contained in the Material Provision.

.110 Insulation materials including facings (except foam plastic insulation--Specifications 104.115 and 104.120) shall be installed in accordance with installation requirements of the Uniform Building Code 1713(c). Flame spread and smoke developed limitations do not apply to facings, provided that the facing is installed in substantial contact with the unexposed surface of the ceiling, floor or wall finish.

.115 When foam plastic insulation is used, a thermal barrier having an index of 15 (UBC Standard No. 17-3) shall be present between the insulation and the interior of the Building.

.120 Foam plastic used in attics or crawl spaces shall be protected against ignition per UBC 1712(b)2.

.125 Recessed lighting fixtures and fan/light combinations that are Type-IC rated by UL may be covered with insulation. Fan/heater, fan/light/heater, and light/heater combinations may be covered with insulation IF they are rated "Heater" or "Air Heater."

.130 Ventilation fans may be covered with insulation IF all holes and penetrations are sealed with a nonflammable sealant.

.135 Only fluorescent fixtures with appropriate thermal protection shall be covered with insulation.

.140 Thermal insulation shall not be installed within 3 inches of fans, lights, and heaters that do not meet the requirements of 104.125 through 104.135 and other heat producing fixtures, and shall not be installed so as to entrap heat and prevent the free circulation of

air (NEC 410-66). Solid, flame resistant baffles attached to the ceiling structure shall be used to maintain required clearances.

.145 All combustible insulation materials, including existing insulation, shall be kept a minimum of 2 inches from metal flues and masonry chimneys. Noncombustible insulation may be installed with no clearance around flues and chimneys if permitted by local or State fire code. However, if the flue is a single wall type (i.e., made from a single thickness of rolled sheet metal) then, a 2-inch air clearance to all insulating materials shall be maintained. Noncombustible insulation is insulation material which conforms to the standard test method ASTM E-136-82.

.150 Knob-and-tube wiring shall be treated with special care. Insulation shall be installed such that free air circulation is maintained around all knob-and-tube wiring (e.g., using tent baffles to maintain a 3-inch clearance, installing insulation under the wiring, etc.). Other methods as adopted at State or local code jurisdictions shall be submitted to the Utility and Bonneville for written approval prior to use. A more stringent local or State fire code may preclude using any one or all of these methods.

.155 Kitchen range exhaust fans vented through the ceiling shall be connected to a duct of not less than 30 gauge galvanized steel (UMC Chapters 10 and 11) which is substantially airtight throughout and which terminates directly to the outside in a vent cap. Backdraft dampers are recommended. Existing installations that substantially meet these requirements are acceptable.

.160 Kitchen range exhaust fans which are vented to the crawl space shall be ducted through to the exterior of the Building in accordance with local codes and the manufacturer's instructions.

.165 Only noncombustible insulation (per ASTM E-136-82) shall be installed in wall cavities adjoining fireplaces and/or chimneys.

.170 Insulation shall <u>not</u> be installed in wall cavities which contain electric space heaters unless fire stops are present which isolate the heater from all contact by the insulation material. Verification shall be accomplished by removal of the heater after the insulation is installed.

.175 Pipe insulation shall not be installed on pressure temperature relief valves, on the operating portion of any valves, or on any other control and safety devices.

.180 Where facings or protective coverings are used on pipe or duct insulation, these materials shall meet flame spread and smoke development requirements of the Codes.

.190 Where water pipe heaters are present for freeze protection, such heaters shall include a thermostat set at approximately 35 degrees Fahrenheit.

104.200 **Installation Provisions for Ceilings under Attic Space--Permanent Housing**

.205 Ceilings shall be insulated to a minimum of R-38 or the highest R-value approaching R-38 which is practical.

.210 Uninsulated sloped ceilings between ventilated attics shall be insulated where practical. Airflow may be maintained over the sloped-ceiling insulation by tubes, baffles, or by

using rigid insulation; or the sloped-ceiling area may be insulated to the full cavity depth where local codes allow, provided containment materials used at the lower and upper cavity openings allow for rapid vapor diffusion.

.215 Uninsulated knee walls adjoining attic spaces shall be insulated to the highest R-value which is practical or minimum of R-11, in accordance with Specification 104.1000 as part of attic insulation.

.220 All exposed ducts located in the attic space which will extend above the level of the finish attic insulation shall be insulated as specified in Specification 104.1400.

.225 Attic access doors which are adjacent to Conditioned Spaces shall be insulated to at least R-30 for horizontal openings and to at least R-11 for vertical openings and weatherstripped as per Specification 107.000.

.230 If water pipes are located in the attic space, water pipe insulation shall be included with ceiling insulation, for freeze protection as per Specification 104.1600.

.235 If vapor barriers are installed with ceiling insulation, the barrier shall be placed between the insulation material and the Conditioned Space adjacent to the ceiling.

104.240 **Ventilation Requirements**

Enclosed attics and enclosed rafter spaces shall have cross ventilation for each separate space. Ventilating openings shall be protected against the entrance of rain and snow.

.245 The net free-ventilating area shall be not less than 1/150 of the area of the space ventilated, except that the area may be 1/300, provided 50 to 60 percent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least three feet above eave or cornice vents with the balance of the ventilation provided by eave or cornice vents or provided a vapor barrier is present between the insulation and the ceiling.

.250 Other configurations of vent placement that provide equivalent performance may also be accepted with written Utility approval or as approved by local code.

.255 Vent openings shall be covered with corrosion-resistant metal mesh with mesh openings of maximum 1/4 inch in dimension.

.260 Air turbines shall not be installed under these specifications; however, ventilating area of existing air turbines may be included by estimating the net free ventilating area of the air turbine in a locked, nonrotating position.

.265 Utility may approve mechanical ventilation when passive ventilating methods are not practical.

104.300 **Installation Provisions for Roofs--Exterior Surface, Permanent Housing**

.305 Roofs shall be insulated to a minimum of R-20 or the highest R-value approaching R-20 which is practical.

.310 Insulation shall not be applied to roofs over ventilated cavities (e.g., vaulted ceilings with ventilated spaces, attics, sloped ceilings connected to attics and/or knee wall spaces, etc.). Ventilated cavities of flat or sloping roofs shall not be blocked.

.315 Insulation shall be in a rigid board form.

.320 A vapor barrier of 1.0 perm or less shall be in place between the insulation and the roof deck. However, if insulation is already present in the roof system, then a vapor barrier shall not be installed.

.325 Roof drainage systems shall function properly after insulation is installed (UBC 3207).

.330 Roof coverings shall be applied directly over the insulation per Section 3208 of the 1991 UBC.

.335 All penetrations through the roof covering and all joints between the roof covering and vertical surfaces (e.g., walls, chimneys, etc.) shall be flashed according to the requirements of the UBC 3208.

.340 The Installer shall contact the Utility and request an "in-progress" inspection by the Utility during the installation.

.345 Other methods of installing exterior roof insulation shall be approved by the Utility in writing prior to beginning the work.

104.400 **Installation Provisions for Roofs--Interior Surface, Permanent Housing**

.405 Roofs shall be insulated to a minimum of R-24 or the highest R-value approaching R-24 which is practical.

.410 Insulation shall be in a rigid board form.

.415 Lighting fixtures or similar items shall be extended to accommodate the lower ceiling level, at the Homeowner's or Homeowner Designee's expense.

.420 All air by-passes shall be sealed to minimize heat loss and moisture damage potential.

.425 Rigid board insulation shall be cut to fit, minimizing openings and gaps between beams that support the roof structure, other necessary protrusions (light fixtures, electrical boxes, etc.) and the insulation itself.

.430 Beam pockets and end-wall grooves created by tongue-and-groove ceiling construction shall be sealed with caulk or with foam tape covered by trim board.

.435 Gaps between insulation boards and fixtures (e.g., ceiling lights, fans, etc.) when greater than 1/8 inch in width shall be filled with self-expanding foam, chemically compatible with the insulation material. Gaps less than 1/8 inch in width shall be caulked.

.440 An in-progress inspection shall be requested by the Installer after the rigid board has been installed and prior to covering the insulation with a fire rated barrier to verify the insulation board is properly installed and sealed. The in-progress inspection shall be documented in the Residence permanent file.

.445 The fire-rated barrier shall be taped at all joints and sealed at all edges to ensure air/moisture infiltration paths have been eliminated.

.450 All associated costs (e.g., painting, taping, etc.) of the fire rated barrier (e.g., 5/8 inch sheet rock) and its installation are beyond the scope of the program and shall be covered by the Homeowner or Homeowner Designee.

104.600 **Installation Provisions for Underfloors--Permanent Housing**

.605 Underfloors shall be insulated to a minimum of R-30, or to the maximum level needed to fill the joist cavities.

.610 Any crawlspace access door adjacent to a Conditioned Space shall be insulated to at least R-19 for horizontal openings and to at least R-11 for vertical openings and shall be weatherstripped with appropriate materials.

.615 All exposed uninsulated ducts located in the crawlspace shall be insulated as specified in Specification 104.1400.

.620 Uninsulated walls separating the crawlspace from Conditioned Space shall be insulated to the highest R-value which is practical or minimum R-11 in accordance with Specification 104.1000.

.625 If water pipes are located in the crawlspace, water pipe insulation shall be included with underfloor insulation, for freeze protection, installed in accordance with Specification 104.1600.

.630 Water pipe heaters may be installed in localities which experience sustained periods of subfreezing temperatures during the winter. Such heaters shall include a thermostat set at approximately 35 degrees Fahrenheit, and they shall be placed around all water pipes (both hot and cold water) in the crawl space inside the pipe insulation in contact with pipe surface. Such installation shall conform to provisions of the National Electric Code and any applicable State or local code.

.635 Underfloor insulation support systems shall be installed so that the insulation remains in contact with the sub-floor, flat and in place for the life of the Residence. Support of the insulation may be provided by wood lath, twine, wire, or other material as approved by the Utility. If fiberboard sheathing is used to support insulation, then the sheathing shall have a water vapor permeability of 10 perms or more.

.640 Vapor barriers installed as a part of floor insulation shall have a perm rating of 1.0 or less and shall be located between the insulation material and the Conditioned Space.

.645 Upon completion of the installation of underfloor insulation, an acceptable ground-cover moisture barrier shall be present (new 6 mil black polyethylene or existing 4 mil polyethylene). All joints shall be overlapped with sufficient material so that all ground surface area is covered.

.650 If underfloor insulation is installed over an unheated basement and the basement has no exposed soil, then the provisions for a ground cover and ventilation are not required. Any basement with exposed soil shall be treated as a crawl space and the provisions for

ventilation shall be required. In addition, a ground cover shall be present which covers the entire area of exposed soil.

.655 Underfloor insulation in areas which are exposed to environmental elements (wind, etc.) shall be protected after installation with a breathable cover or some type of perimeter system (e.g., skirts).

.660 Ground covers are not required for Residences which are built on stilts and have no perimeter system which creates a crawl space.

104.665 **Ventilation Requirements**

Underfloor crawlspace areas shall be ventilated by openings in exterior foundation walls. Such openings shall have a net area of not less than 1 square foot for each 150 square feet of underfloor area.

Where moisture due to climate and ground water conditions is not considered excessive, the Utility may allow operable louvers and may allow the required net area of vent opening to be reduced to 1/300 or less (minimum 1/1500), provided the underfloor ground surface area is covered with an approved ground cover.

Openings shall be located as close to corners as practical and shall provide cross ventilation. The required area of such openings shall be approximately equally distributed along the length of at least two opposite sides. They shall be covered with corrosion-resistant wire mesh with mesh openings of 1/4-inch in dimension. Existing vent openings which are covered with wire mesh need not be modified.

.670 Other configurations of vent placement that provide equivalent performance may also be accepted with written Utility approval or as approved by local code official.

.675 Contractors may approve mechanical ventilation when passive ventilating methods are not practical.

.680 If crawlspace ventilation cannot be accomplished in accordance with these requirements, underfloor insulation shall not be installed.

104.800 **Installation Provisions for Exterior Perimeters --Permanent Housing**

.805 Exterior perimeter insulation may be installed on Residences with basements, slab on grade floors or an existing whole-house plenum system.

.810 Insulation installed shall have a minimum thermal resistance of R-10 in exterior applications.

104.820 Slab, Crawlspace Plenum, or Basement Exterior Perimeter Insulation Installation Provisions:

.1 Insulation shall be installed from the bottom edge of the siding to a depth equal to the local "frost line" or 2 feet below grade, whichever is greater. In those areas that do not have freezing conditions or where the "frost line" is higher than 12 inches, the insulation shall extend a minimum of 12 inches below grade. Insulation shall not be installed below the level of the footing, but shall extend horizontally away from the footing for the remaining required distance. Under

no circumstances shall excavation take place below the level of any foundation footing.

.2 Insulation shall be adhered to the foundation with an adhesive suitable for the purpose installed in continuous horizontal beads to block insect infestation.

.3 The exterior surfaces of the insulation material shall be water proofed with a suitable barrier and shall be protected from mechanical damage, solvents, mastics, moisture, and ultraviolet light degradation. Above grade, the insulation shall be covered with a suitable coating compatible with either adjacent walls or the previously exposed foundation surface in color and general surface appearance.

.4 Metal "Z" flashing shall be installed at the top edge of the insulation with the vertical flange extending up behind the siding to prevent water from getting behind the perimeter insulation.

.5 For exterior perimeter installation, only insulation board meeting the material requirement 204.030 shall be installed.

104.1000 **Installation Provisions for Unfinished Walls (Exposed Frame Wall, Concrete or Masonry Wall)--Permanent Housing**

.1005 Walls shall be insulated to a minimum of R-11.

.1010 Vapor barriers shall be installed when practical. Vapor barriers installed as part of wall insulation shall have a perm rating of 1.0 or less and shall be located between the insulation material and the Conditioned Space.

.1015 When rigid insulation is applied to the exterior stud surfaces of an open cavity frame wall, the insulation shall be installed tightly to minimize air leakage and an adequate air/vapor barrier shall be installed at the warm side of the insulation.

.1020 Upon completion of exterior surface retrofits, the exterior wall shall be weathertight with window and door jambs extended or modified to provide adequate drainage. Siding shall be installed per insulation or siding manufacturer instructions or as approved by the Utility.

.1030 See Specification 104.100 for flame spread and thermal barrier requirements of thermal insulation.

104.1300 **Installation Provisions for Exterior Wall Cavities--Permanent Housing**

.1305 Walls shall be insulated to minimum R-11 or the highest R-value that is practical.

.1310 Loose-fill insulation (fiberglass, rockwool, and cellulose) is acceptable for use in walls. Application of other materials shall be approved by the Utility and Homeowner or Homeowner Designee in writing prior to installation.

.1315 Insulation may be installed in wall cavities that are:

1. 3-1/2 inch deep or greater with no insulation or 1 inch or less of existing insulation; or
2. less than 3-1/2 inch deep with no existing insulation.

.1320 When blowing loose fill insulation, the insert tube method shall be used. Any other method of installation must be approved in writing by the Utility.

.1323 The manufacturer's instructions shall be followed when blowing wall cavities.

.1324 Access to the wall cavities may be accomplished by either removing pieces of the siding prior to drilling through the sheathing, or by drilling directly through the siding and the sheathing.

.1325 All wall cavities shall be filled from the exterior side unless approved in writing by the Utility and the Homeowner or Homeowner Designee.

.1330 The Utility shall verify the installation of insulation by inspection at electrical outlet or switch boxes, by in-progress inspection or other method as determined by the Utility. The Utility shall document to the Residence file the type of verification used.

.1335 The Utility shall check a minimum of three electrical wall outlets or switch boxes to ensure that any insulation material which may have entered the boxes during blow-in wall insulation application was removed by the Installer.

.1340 When access holes for installing the insulation are drilled through the finish siding and sheathing, the Utility shall verify that all holes were adequately plugged and provide a tight weatherproof seal.

104.1400 **Installation Provisions for HVAC Ducts--Permanent Housing**

.1405 HVAC ducts shall be insulated to a minimum R-11.

.1407 Ducts shall be properly supported before insulation is installed. All new and all accessible existing duct joints, plenum drives, metal joints to include all slips and drives shall be mechanically fastened with screws. Flexible ducts shall be attached using nylon/plastic straps tightened with a manufacturer approved tool (hand tightening is not acceptable) or stainless steel worm drive clamps. Mastic and/or tape shall not be used as mechanical fasteners.

.1410 All new and all accessible existing HVAC supply and return ducts, air handlers, and plenums inside and outside the heated space shall be sealed at all joints and corners, including prefabricated joints, with duct mastic. It is unnecessary to seal longitudinal seams unless they are damaged. Tape is not allowed except for use on operable doors in the system such as on the air handler. In this case, foil tape with a 15-mil butyl sealant, or cleaning the joint with a suitable solvent and sealing with a UL-181 listed tape may be used.

.1415 Special care shall be taken when insulating flex duct so that the duct wall does not collapse.

.1420 Ducts subject to human contact during service or storage activities (e.g., in garages, basements, attics used for storage) shall be insulated with a material that has a suitable facing as defined in Specification 204.040 (flame spread requirement).

.1425 The entire system including plenums and boots shall be sealed and insulated. All duct insulation should be installed and supported using mechanical fasteners such as permanent plastic straps or nylon twine. Tape is not a mechanical fastener. Tape may be used at insulation seams to provide a continuous barrier.

.1430 Ducts which carry chilled air (any type of heating and air conditioning system) shall be completely insulated with a material that has a facing with the proper flame spread rating as defined in Specification 204.040.

104.1600 **Installation Provisions for Hydronic and Water Pipe Insulation-- Permanent Housing**

.1605 Pipe insulation shall be installed to minimum R-values determined according to the following:

Hydronic pipes having a nominal diameter of 1-inch or less shall be insulated with material having a minimum R-value of 3.6 tested in accordance with ASTM C-177-85 at a mean temperature of 75 degrees Fahrenheit. Pipes with a nominal diameter greater than 1 inch shall be insulated with material having a minimum R-value of 5.4 tested in accordance to ASTM C-177-85 at a mean temperature of 75 degrees Fahrenheit.

Water pipes shall be insulated with material having a minimum R-value of 3.0 tested in accordance with ASTM C-177-85 at a mean temperature of 75 degrees Fahrenheit.

.1610 The piping shall be free from water leaks and properly secured to support the weight of the piping and insulation.

.1615 The product may be either flat and capable of being molded to the outside surface of common pipe sizes, or preformed to fit standard pipe diameters. If the product is preformed, dimensions shall be specified by the Utility and be appropriate for the pipe size intended to be insulated.

.1620 Pipe insulation shall be installed on piping, joints, elbows, valve bodies, etc., except those sections of the system which are obstructed by existing wood framing members or other Residence components. Insulation material shall be cut and folded or otherwise molded to completely cover all sections of the system without compressing the insulation or allowing gaps to occur in the insulation.

.1625 Insulation shall be firmly secured to the piping system using adhesive, tape, or plastic or galvanized wire ties.

.1630 All slits and joints in the material shall be sealed on hydronic heating system pipes.

.1635 If insulation is installed on piping exposed to the weather, then such insulation shall be resistant to degradation from moisture, ultra-violet light, and extremes in temperature, or a jacket or facing shall be installed that protects the insulation from these conditions. Manufacturer's recommendation for outdoor installations shall be followed in all cases.

105.000 **WINDOWS**

.005 Storm windows, vent conversions and fin-bar conversions are not acceptable under this program. New prime windows and patio doors (French or Sliding) that are Energy Star® labeled for the Northern Climate Zone may replace existing dual-glazed windows in non-wood or vinyl framed windows or single-glazed windows regardless of frame type.

105.400 **General Installation Provisions**

.405 Window frames shall be permanently affixed to the Residence. After installation, access to latches shall not be impaired. Upon installation completion, units shall operate smoothly and properly. Hardware shall be durable, function properly, and not create interference. When closed, the entire assembly shall provide a complete weather-barrier to the entire opening. Glazing sealants shall be resilient, non-hardening compounds, tapes, or gaskets with established long life expectancy.

.410 The correct size, shape, and type of windows for the openings shall be assured by the Installer. Each window shall be Measured for appropriate clearances and "out-of-squareness" to match the prime window or prime opening. The window may need to be adjusted to be square, plumb, and level without distortion to the window parts, upon installation.

.420 Any installation that results in increased window area, including garden windows, shall not be allowed under this Program.

.435 No windows shall have exposed burrs, sharp corners or other potential hazardous condition that could be encountered by occupants during normal use.

.440 Sources of evident water penetration through prime openings shall be located and corrected. Necessary repairs shall be accomplished by the Homeowner or Homeowner Designee prior to installation of storm windows.

105.500 **Health and Safety Requirements**

.505 Safety glass shall be used under the following conditions:

.1 Glazing in entrance doors;

.2 glazing in fixed and sliding panels of sliding doors and panels in swinging doors other than wardrobe doors;

.3 glazing in fixed or operable panels adjacent to a door where the nearest exposed edge of the glazing is within a 24-inch arc of the vertical edge of the door in a closed position and where the bottom edge of the glazing is less than 60-inches above the floor or walking surface unless there is an intervening wall or permanent barrier between the door and the glazing;

.4 glazing in an individual fixed or operable panel other than those covered by 105.505.3 above that meet ALL of the following conditions:

a. have an exposed area of an individual pane greater than 9 square feet;
b. has an exposed bottom edge less than 18 inches above the floor;
c. has an exposed top edge greater than 36 inches above the floor; and

d. has one or more walking surfaces within 36 inches horizontally of the plane of the glazing.

In lieu of safety glazing, such glazed panels may have a protective bar installed on the accessible sides of the glazing 34 to 38 inches above the floor. The bar shall be capable of withstanding a horizontal load of 50 pounds per linear foot without contacting the glass and be a minimum of 1 1/2 inches in height.

.5 Glazing in any portion of a building wall enclosing showers, hot tubs, whirlpools, saunas, steam rooms, and bathtubs where the bottom exposed edge is less than 5 feet above a standing surface or drain inlet.

Each pane of safety glass lite shall be marked with the name of the manufacturer and place of manufacture, and shall certify compliance with all applicable standards for the manufacture and testing of safety glass (e.g., CPSC Class 2).

.515 Retrofitted. Vertically-opening prime windows shall not free fall.

105.900 **Additional Installation Provisions for Replacement of Prime Windows -- Permanent Housing**

.910 Multi-glazed windows may replace single-pane glazing in entrance doors located between Conditioned Space and unconditioned space.

.915 Installation procedures employed shall ensure that the integrity of the multi-glazed seal is maintained.

.920 A sealed, insulating-glass panel shall be separated from the perimeter of any metal retaining frame by an elastomeric thermal barrier (e.g., channel glazing). If sealed glazing is not used, individual panes of glass shall be separated from any metal retaining frame, and from any adjacent panes of glass, by an elastomeric thermal barrier.

.925 Glazing compounds shall not contact the seal of the multi-glazed unit or the material shall be shown to be chemically compatible with the seal of the multi-glazed unit.

106.000 **DOORS**

.005 This section covers the requirements for the construction and installation of sliding multi-glazed inserts, sliding door replacements with new multi-glazed units, and French doors. French doors with sealed, insulating glass may replace existing single-glazed french doors or existing single-glazed sliding doors. New prime patio doors (French or Sliding) that are Energy Star® labeled for the Northern Climate Zone may replace existing dual-glazed windows in non-wood or vinyl framed windows or single-glazed windows regardless of frame type.

.010 The installation of storm doors and insulated entrance doors are not allowed under the Program.

.015 The installation of storm doors over sliding glass doors are not allowed under this Program.

.020 The installation of fin-bar conversions in sliding glass doors is not allowed under this program.

106.100 **Installation Provisions for Sliding and French Doors--Permanent Housing**

.105 Sliding- and French-door retrofit Measures shall be installed so that a durable, effective, infiltration barrier is provided.

.110 Gaps and cracks exposed to the elements shall be caulked on both existing and added framing members so as to provide a weathertight installation.

.115 Worn or damaged weatherstripping or sealants on the prime assembly shall be replaced when the door is weatherized. This includes replacement of the meeting rail weatherstripping. All materials used shall be compatible to the manufacturer's slide system and be a permanent repair or replacement.

107.000 **INSTALLATION PROVISIONS FOR AIR SEALING**

107.100 **Prescriptive Air Sealing**

.105 All gaps, holes, joints and seams in HVAC ducts and plenums shall be sealed. This includes sealing all joints from the furnace to the plenum, the plenum to the main duct, the boots for each register to the main duct, the boots for each register to the floor. Seal all branch-duct to main-duct connections when necessary.

.110 All gaps and holes where HVAC ducts, plenums and registers penetrate the envelope shall be sealed.

.115 All gaps between exhaust-fan ducts and the envelope, including those for kitchen ranges, bathrooms and clothes dryers, shall be sealed. All missing or deteriorated backdraft dampers shall be replaced.

.120 All gaps between the ceiling for swamp cooler ducts shall be sealed.

.125 All electrical penetrations, including the electrical service panel shall be sealed.

.130 All air bypasses in electrical/plumbing chases and around chimneys, flues, etc., except for single-wall metal flues, that penetrate floors and ceilings shall be sealed with 5/8-inch, Type-X sheet rock.

109.000 **CLOCK THERMOSTATS**

.005 Clock thermostats may be installed when determined to be appropriate by the Utility.

109.100 **Installation Provisions**

.105 Clock thermostats shall be installed in compliance with local codes and the manufacturer's instructions.

.110 The Installer shall provide written instruction materials to the Homeowner or Homeowner Designee. The Installer shall also explain the clock thermostat's operation and method of adjustment to one or more members of the Residence.

PART II--MATERIAL PROVISIONS

Index to Sections

202.000 GENERAL MATERIAL PROVISIONS

.005 Materials, components or products installed under the Conservation and Renewable Resources Rate Discount Program (C&R Discount Program) shall meet the criteria defined in this specification. Materials, components or products for which the Utility or Bonneville has the opportunity to accept under the specification shall be submitted to the Utility or Bonneville for evaluation and written acceptance prior to their installation. Product evaluation shall be based on test results from a mutually acceptable independent laboratory indicating compliance to the requirements contained in this specification.

.010 The Utility or Bonneville reserves the right to identify and disapprove for use in the C&R Discount Program, any weatherization product at any time when it deems the product not satisfactory for the C&R Discount Program.

.015 Where written acceptance of materials, components, or products is required, the intent is that, unless otherwise stated in the specification or the acceptance, once it is accepted by a Utility or Bonneville for one installation, the material, component, or product shall be acceptable for all other similar installations without resubmittal to the Utility or Bonneville except as noted in Specification 202.010 above.

.020 The Utility may decide that a product or its installation is unsatisfactory after an inspection is performed even if that product has been accepted previously by the Utility or Bonneville. A rejection based on the installation may require the Installer to correct the work done. Also, the Utility has the right to disapprove the use of the product on all future jobs. Such disapproval shall be issued in writing and shall identify the flaws found in the product or its installation. The Utility shall notify Bonneville of any products which are disapproved.

.025 All materials used under the C&R Discount Program shall be resistant to corrosion, degradation from ultraviolet light, and be compatible with other elements and materials (will not react chemically, etc.) so as to enhance long life expectancy of installed Measures.

204.000 INSULATION MATERIAL PROVISIONS

.005 The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals (1989 or later) is the accepted standard for R-value/U-value of materials used by Installers. Products that vary from ASHRAE may be acceptable if they comply with current Federal Trade Commission (FTC) certifications, testing and labeling rules, and have independent laboratory testing which indicates the product's R–value/U-value.

.010 All materials used for thermal insulation shall meet the requirements of UBC 1713 and UBC 1712 and meet the requirements contained in the applicable Federal specifications listed below. Certain requirements in these specifications refer to voluntary standards such as ASTM for specific test methods or physical properties. For purposes of compliance with this weatherization specification, the referenced voluntary standard shall be considered as mandatory.

.1	Mineral Fiber Blankets/Batts	HH-I-521F
.2	Mineral Fiber Loose Fill	HH-I-1030B
.3	Cellulose Loose Fill	ASTM C-739-86 16 CFR 1209 16 CFR 1404
.4	Perlite	ASTM C-549-81
.5	Vermiculite	ASTM C-516-80
.6	Polystyrene Board	ASTM C-578-87A
.7	Polyurethane and Polyisocyanurate Board	HH-I-530B

.015 In addition, loose-fill cellulose manufacturers shall subscribe to an ongoing laboratory quality control inspection Program substantially equivalent to the "UL classification" Program. This Program verifies periodically manufacturer's adherence to the requirements of CPSC cellulose regulation 16 CFR 1209 (i.e., critical radiant flux, smoldering combustion, settled density, and corrosiveness). Also, the UL label or equivalent label shall appear on every bag of material. It shall include the file number (R-number) of the manufacturer and the issue number for labels purchased.

204.020 All insulation materials installed shall meet the requirements of the Federal Trade Commission Labeling Rule (16 CFR 460). Additional labeling on weatherization materials may be required under the RCS regulations for covered utilities.

.025 Urea-Formaldehyde foam insulation is not acceptable.

.030 Insulation board which is used for perimeter insulation shall have a moisture absorption rate no greater than 0.3 percent when tested in accordance with ASTM C-272-53 and a water vapor transmission rate no greater then 2.0 Perm/inch of thickness when tested in accordance with ASTM E-96-80. Expanded polystyrene (bead board) is not acceptable.

.035 Duct insulation for use in unconditioned areas on ducts not subject to routine human contact shall meet the requirements of Federal Specification HH-I-521F, any type. For ducts subject to routine human contact during servicing or storage activities, (e.g., in garages, basements, attics used for storage) the insulation shall meet HH-I-521F and either be classified as Type 2 or 3, Class A (reflective or non-reflective, flame rated, faced batts) material. Faced material shall have a covering which provides physical protection to the insulation and has a flame spread of 50 or less when tested in accordance with ASTM E-84-88 when used on duct systems which serve single Residences only. In Buildings having a duct system which serves more than one Residence, the covering shall have a flame spread of 25 or less when tested in accordance with ASTM E-84-8O.

.040 Pipe insulation shall meet the following provisions:

.1 Pipe insulation materials shall be comprised of mineral fiber, elastomers, urethanes, isocyanurates, or other suitable materials;

.2 The material shall be capable of withstanding continuous operating temperatures of not less than 180 degrees Fahrenheit. Hydronic pipe insulation shall be capable of continuous operation at 250 degrees Fahrenheit;

.3 The product shall be finished with a jacket or facing, suitable to resist damage and degradation. However, if the product is made of closed cell foam and is installed in a location protected from moisture, ultraviolet light and extremes in temperature, then a protective jacket or facing is not required; and

.4 The insulation material, any jackets or facings, and adhesive, if used, shall be tested as a composite product and shall have a flame spread rating of 25 or less, and a smoke density of 50 or less when tested in accordance with ASTM E-84-88.

205.000 **WINDOW MATERIAL PROVISIONS**

.005 Laboratory tests required to satisfy any of the preceding provisions shall be conducted no less frequently than every four years.

.015 All materials shall have sufficient strength and durability to resist damage or distortion from wind loads, thermal stress (including that due to solar gain), or induced installation stresses. All operable windows shall be of sufficient combinations of glass/slider-frame rigidity to prevent bowing after installation.

.020 Glazing for windows is restricted to glass or as provided for in this specification. All lites shall be of good quality glazing materials, and shall meet Federal Quality Control Specifications ASTM C1036-85 and ASTM C1048-88.

.030 Meeting rails of movable windows shall be provided with a durable, effective, infiltration barrier and shall include a mechanical interlock or equivalent mechanism.

All sliding panes or associated channels shall be fitted with infiltration and weather barrier devices.

.035 Vertical moving windows shall be designed to hold the sash secure and level in ventilating positions.

.040 Security latches are required on all prime window replacements.

.045 Weatherstripping material used in windows shall be appropriate to the window type and its operation and shall provide a durable effective seal.

.050 Each safety glass lite shall be marked with the name of the manufacturer and place of manufacture, and shall certify compliance with all applicable standards for the manufacture and testing of safety glass (e.g., CPSC Class 2).

.055 Replacement Sealed Insulating Glass Units (Glazing Only):

.1 Shall be wood stopped, have a minimum air space of 1/2 inch, have one low-e coating with an emissivity of 0.2 or less and meet the requirements of 205.075.2 (e.g., site built picture type windows).

.2 Shall incorporate sealed, insulating glass, certified as "Class A" under a SIGMA-approved Program, which requires compliance with ASTM E 774-88. Manufacturer identification of certified panels shall be stamped, engraved, or inked on the spacer which separates the panes of glass, etched on the glass itself, or printed on a label located between the panes of glass and affixed to the glass. Such identification indicates the certifying agency (e.g., ALI or IGCC) and the performance class or classes of the unit.

.060 Replacement Prime Windows (Glazing, Sash, and Frame):

.1 Prime replacement windows shall meet the Energy Star® specifications for the Northern Climate Zone and shall be NFRC labeled and certified to have a maximum U-factor of 0.35.

206.000 SLIDING AND FRENCH DOOR MATERIAL PROVISIONS

.005 Door products shall meet the Energy Star® specifications for the Northern Climate Zone and shall be NFRC labeled and certified to have a maximum U-factor of 0.35.

206.010 Sealed insulating glass panels installed in door assemblies:

.1 Shall have a minimum spacing of 1/2 inch, have one low-e coating with an emissivity of 0.2 or less when installed in a frame on the job site, and

.2 Shall be certified as "Class A" under a SIGMA-approved Program. This certification means the manufacturer is participating in a continuing quality assurance Program which requires compliance with ASTM E-774-88. Manufacturer identification of certified panels shall be stamped, engraved, or inked on the inside of the spacer which separates the panes of glass, etched on the glass itself, or printed on a label located between the panes of glass and affixed to the glass. Such identification indicates the certifying agency (e.g., ALI or IGCC) and the performance class or classes of the unit.

.015 Glazing shall be restricted to safety glass. The thickness, strength, and quality of glass and glazing shall meet with the requirements of Chapter 54 of the Uniform Building Code. All lites shall be of distortion-free, good quality glazing, and shall meet ASTM C1036-85 and ASTM C1048-88.

.020 Screens shall be provided with all complete door assembly replacements.

207.000 WEATHERSTRIPPING MATERIAL PROVISIONS

.005 Products used in the Program shall be designed to resist deterioration when subjected to sunlight, moisture, other weather conditions, and normal use.

.010 Weatherstripping shall be of the following types:

.1 Hollow, cold weather, vinyl tube type or vinyl-silicone composite material which is affixed to a prepunched aluminum flange or extrusion;

.2 spring metal cushion weatherstrip;

.3 cold weather vinyl type or vinyl-silicone composite material which is affixed to a prepunched aluminum flange or extrusion;

.4 interlocking metal weatherstrip;

.5 two-piece, magnetic bellows-type weatherstrip;

.6 vinyl bulb or vinyl-silicone composite material with a semirigid flange; or

.7 polypropylene replacement pile.

Other types of weatherstripping material shall be submitted to the Utility for examination and written Bonneville approval prior to use.

208.000 CAULKING MATERIALS PROVISIONS

.005 Caulking shall be one of the following materials conforming to the Federal Specifications listed below or material demonstrating equivalent performance in resiliency and durability:

.1	Silicone Rubber	TT-S-1543A
.2	Polysulfide or Polyurethane (single component)	TT-S-230C
.3	Polysulfide or Polyurethane (multiple component)	TT-S-227E
.4	Acrylic Terpolymer (single component)	TT-S-230C
.5	Butyl Rubber	TT-S-1657

.6	Acrylic Latex	ASTM C834-76

.010 The cartridge or tube containing the caulking material shall be labeled indicating conformance to the applicable Federal Specification.

209.000 **CLOCK THERMOSTAT MATERIAL PROVISIONS**

.005 The clock thermostat ("low-voltage" and "line voltage" types) shall meet the requirements of NEMA DC 3-1984.

.010 The clock thermostat shall be easily Programmable by the Homeowner or Homeowner Designee and shall be at least a 24-hour type. Seven day clocks are preferred. In addition, the thermostat shall allow for at least two separate setback periods per day (i.e., day as well as night setback). Where central air conditioning (or a heat pump) is present, the thermostat shall allow for summer "setup" as well as winter "setback" control.

.015 The clock thermostat shall have independent adjustment capability for the "high" and "low" temperature set points.

.020 Thermostats used with heat pumps shall be capable of restricting the use of electric resistance elements during the normal temperature pickup periods. Such thermostats shall be designed so that the temperature pick up is accomplished by using heat pumping as much as possible and electric resistance elements only when necessary. This may be accomplished either by inhibiting electric resistance elements or by applying an electronic control technique which allows for the operation of electric resistance elements only when the heat pump will be unable to attain the setpoint within a suitable recovery time. The Utility or Bonneville shall approve each heat pump thermostat model, in writing, prior to installation.

.025 Line voltage clock thermostats shall be tested and meet minimum performance requirements of Canadian Standards Association C273.4-M1978 or other equivalent test procedures and standards.
